

B19
Contd

lubricant layer include, but are not limited to, a silicon compound such as SiO_2 , Si_3N_4 , SiC , or a silicic acid polymer; a metal oxide such as Al_2O_3 , CoO , Co_3O_4 , Co_2O_3 , $\alpha\text{-Fe}_2\text{O}_3$, Cr_2O_3 , CrO_3 , TiO_2 , ZrO_2 , ZnO , PbO , NiO , MoO_2 , or SnO_2 ; a metal sulfide such as MoS_2 , WS_2 , or TaS_2 ; a metal carbide such as TiC , ZrC , CrC , or TaC ; a metal fluoride or graphite fluoride; a metal such as W, Cr, Ir, NiB, NiP, FeCr, NiCr, Sn, Pb, Zn, Tl, Au, Ag, Cu, Ga, Ru, Rb, Mn, Mo, Os, or Ta, or an alloy of each of these metals; a semiconductor such as Si, Ge, B, or C (e.g., amorphous hydrogenated carbon, amorphous nitrogenated carbon, amorphous carbon, diamond-like carbon, or a mixture thereof, or graphite-like carbon or a mixture thereof); and plastic such as polytetrafluoroethylene, a phenolic resin, or polyimide.--

Please replace the paragraph beginning on page 33, line 12 with the following rewritten paragraph:

b20

--Lubricant films were made from a solution containing Pennzane® X-2000 at 0.055 wt.%, 0.11 wt.% and 0.22 wt.% and Z-DOL® at 0.1 wt.%, respectively. These films were tested in the HVBOIP tester. Both normal force F_z and frictional force F_x for each film were measured. The coefficient of friction is the ratio of F_x/F_z . Figs. 4 and 5 are plots for two Pennzane® X-2000 lubricant films. In both figures, normal force F_z , frictional force F_x , and coefficient of friction F_x/F_z are plotted as a function of the number of cycles. The coefficient of friction for the Pennzane® X-2000 lubricant film with 0.11 wt.% is about 0.4, whereas the coefficient of friction for the Pennzane® X-2000 lubricant films with 0.22 wt.% is decreased to about 0.25.--

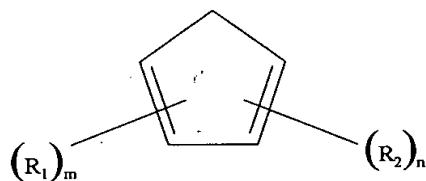
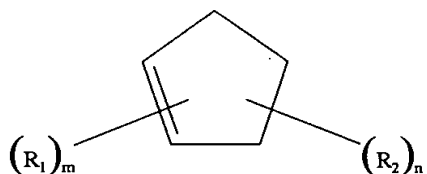
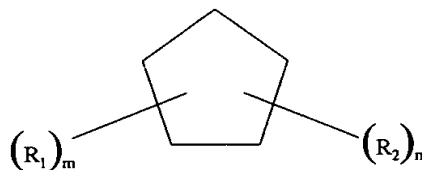
In the claims:

Please amend claims 1-12, 14-26, 29-30, 33, and 35 as follows. A copy of the marked-up claims highlighting the amendments is attached hereto as Appendix A. A copy of the currently pending claims is attached hereto as Appendix B.

1. (Once Amended) A magnetic recording medium, comprising:
 - a non-magnetic support;
 - a magnetic layer formed on the support; and
 - a lubricant layer over the magnetic layer, the lubricant layer including a compound selected from the group consisting of hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted

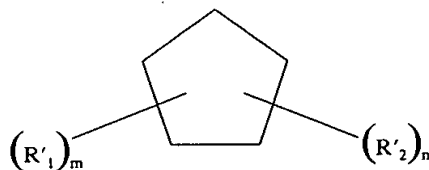
cyclopentene, hydrocarbyl-substituted cyclopentadiene, and mixtures thereof.

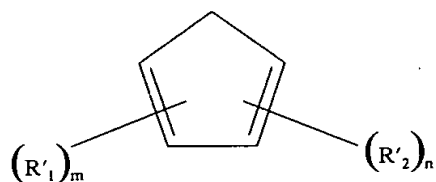
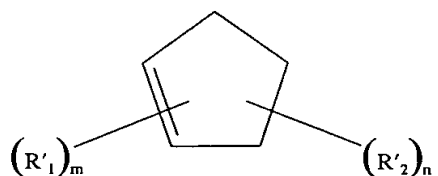
2. (Once Amended) The magnetic recording medium of claim 1, wherein the lubricant layer includes a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, or a hydrocarbyl-substituted cyclopentadiene as represented by the following respective formulas:



wherein R_1 and R_2 are respectively a hydrocarbyl group, and m and n are respectively zero or a positive integer and the sum of $m + n$ is greater than zero.

3. (Once Amended) The magnetic recording medium of claim 1, wherein the lubricant layer includes a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, or a hydrocarbyl-substituted cyclopentadiene as represented by the following respective formulas:

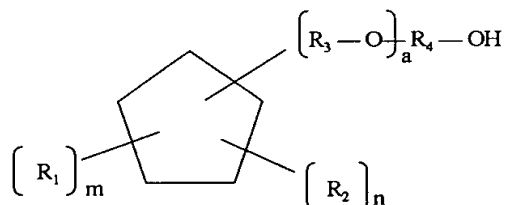


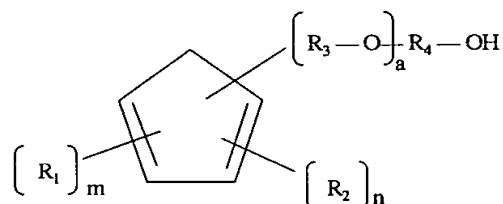
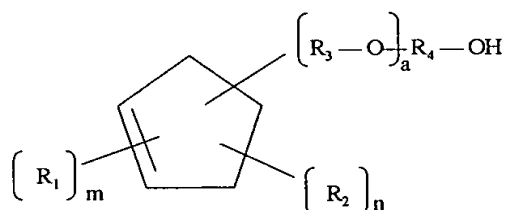


wherein R'_1 and R'_2 are respectively a functionalized hydrocarbyl group which includes a functional group selected from $-OH$; $-NH_2$; carboxylic acid; carboxylic ester; phenolic ester; polyether; amide; amine; sulfonamide; thiophosphate; and phosphate, and m and n are respectively zero or a positive integer and the sum of $m + n$ is greater than zero.

4. (Once Amended) The magnetic recording medium of claim 1, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene include at least one functional group selected from the group consisting of hydroxy, carboxylic acid, amine, carboxylic ester, carboxylic amide, phosphate, and sulfur-containing groups.

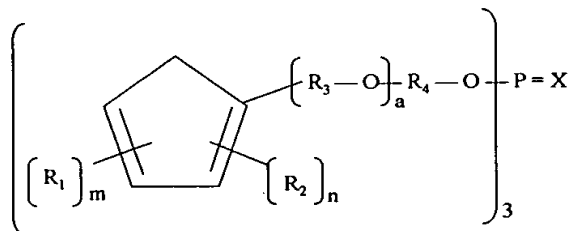
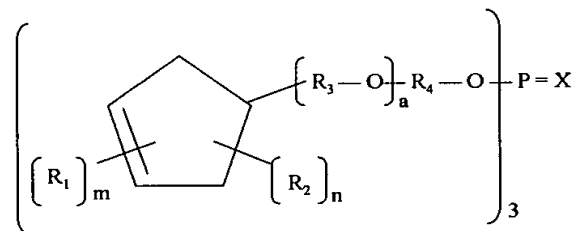
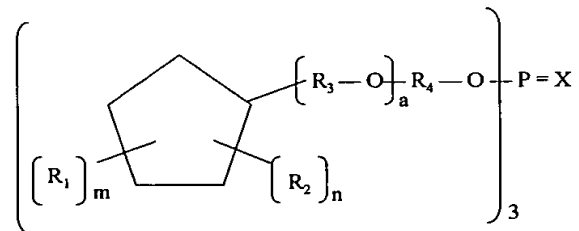
5. (Once Amended) The magnetic recording medium of claim 4, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:





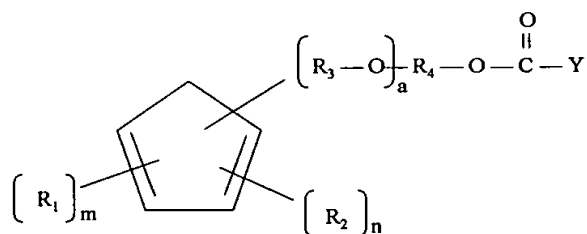
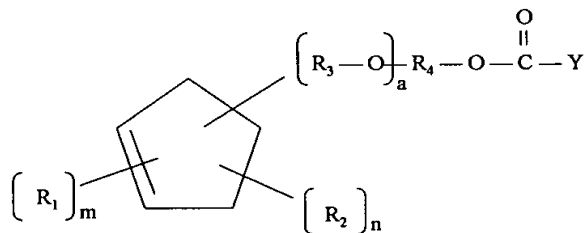
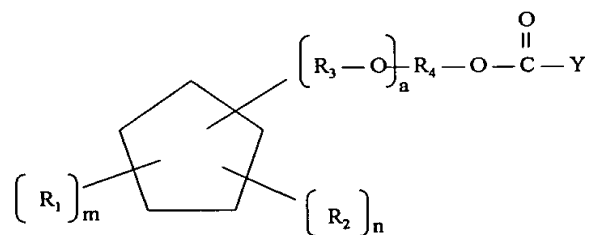
wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1 , R_2 , R_3 , and R_4 are individually a hydrocarbyl group.

6. (Once Amended) The magnetic recording medium of claim 4, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:

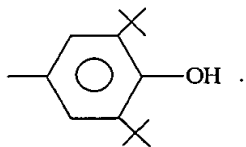


wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1 , R_2 , R_3 , and R_4 are individually a hydrocarbyl group; X is either oxygen or sulfur.

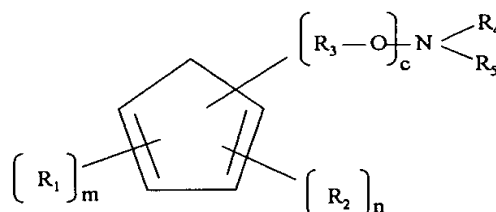
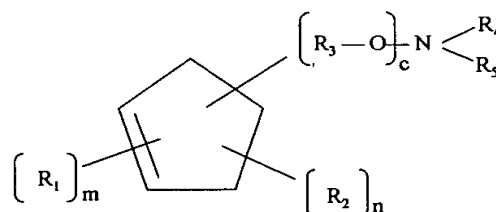
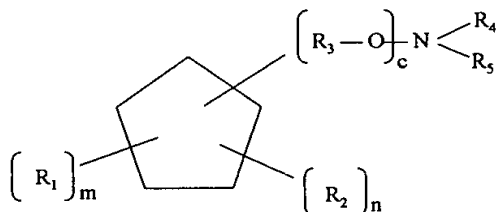
7. (Once Amended) The magnetic recording medium of claim 4, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1 , R_2 , R_3 , and R_4 are individually a hydrocarbyl group; Y is -OH, -NH₂, or

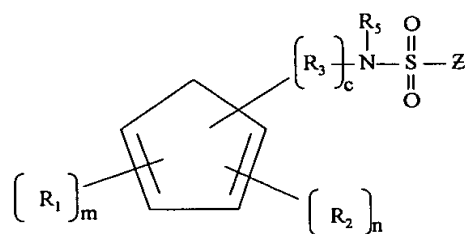
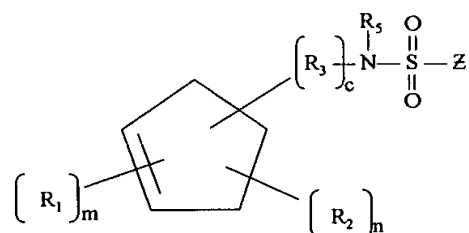
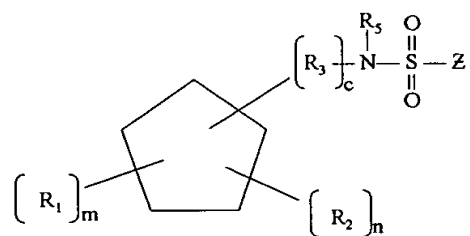


8. (Once Amended) The magnetic recording medium of claim 4, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



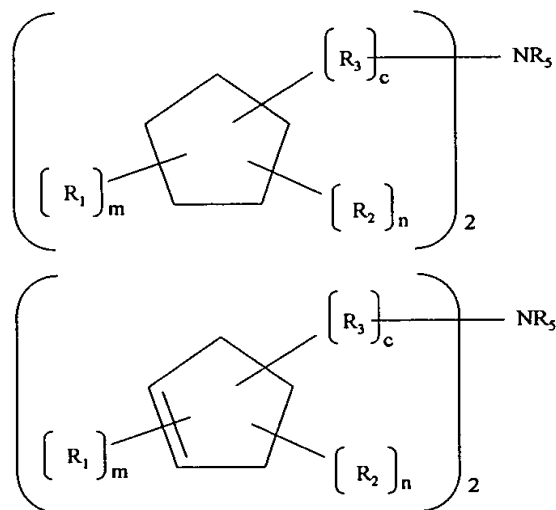
wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1 , R_2 , and R_3 are individually a hydrocarbyl group; R_4 and R_5 individually are hydrogen or hydrocarbyl.

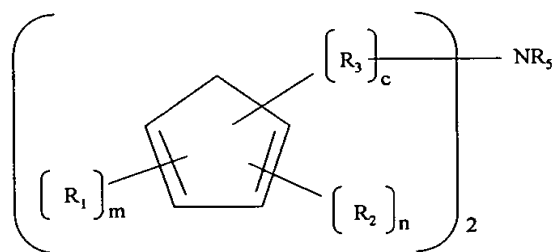
9. (Once Amended) The magnetic recording medium of claim 4, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1 , R_2 , are individually a hydrocarbyl group; R_5 is hydrogen or hydrocarbyl; Z is hydrocarbyl.

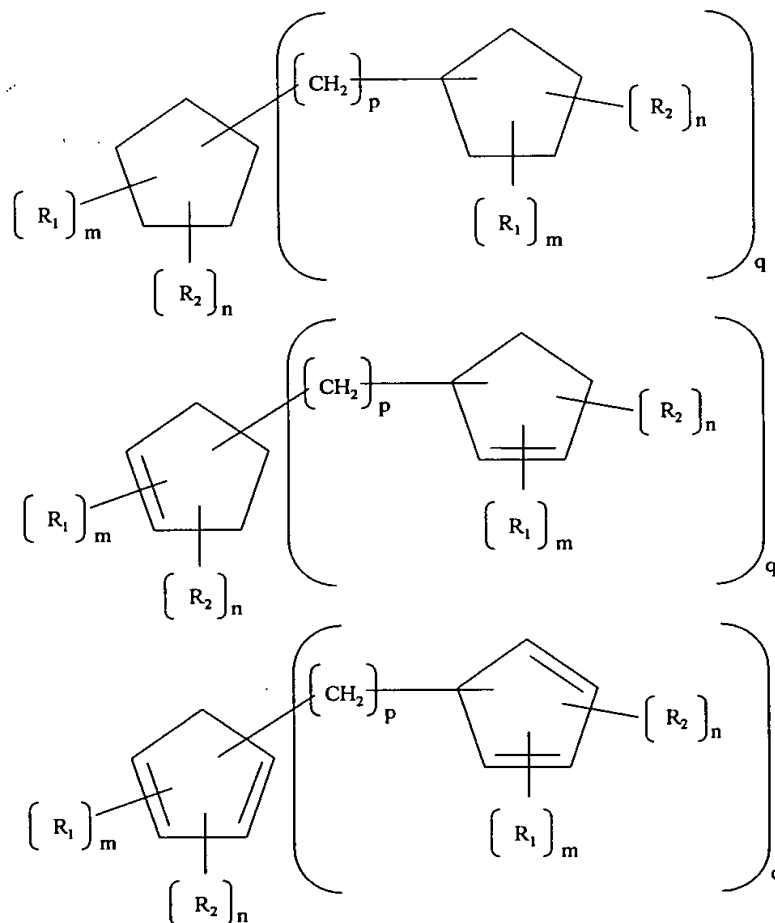
10. (Once Amended) The magnetic recording medium of claim 4, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:





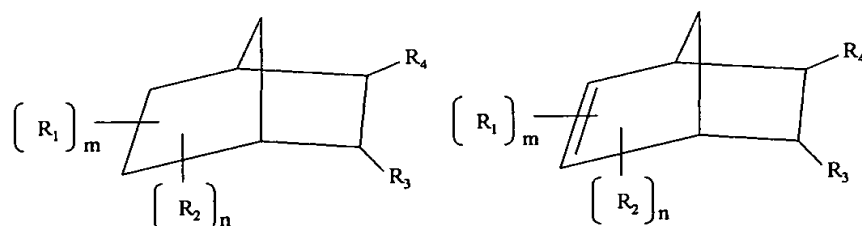
wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R₁, R₂, and R₃ are individually a hydrocarbyl group; R₅ is hydrogen or hydrocarbyl.

11. (Once Amended) The magnetic recording medium of claim 4, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



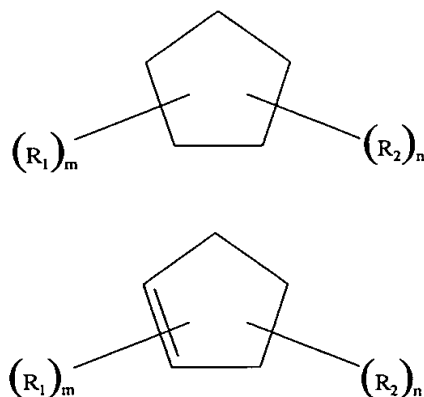
wherein p is 1, 2, 3, ..., or 10; q is 1, 2, 3, ..., or 10; m and n are zero or a positive integer; R_1 and R_2 are individually a hydrocarbyl group.

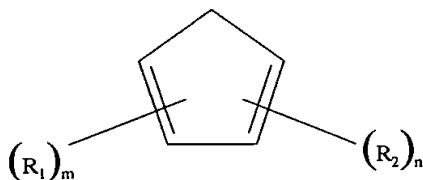
12. (Once Amended) The magnetic recording medium of claim 4, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



wherein m and n are zero or a positive integers; R_1 and R_2 individually are a hydrocarbyl group; R_3 and R_4 individually are hydrocarbyl, hydroxy, nitrile, carboxylic acid, carboxylic amide, or carboxylic ester.

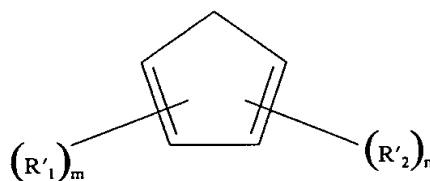
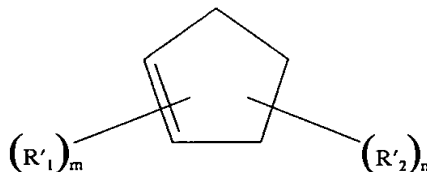
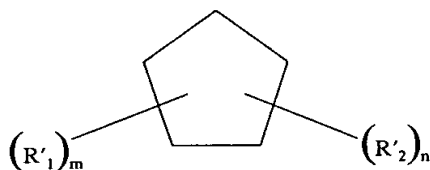
14. (Once Amended) The magnetic recording medium of claim 13, wherein the lubricant layer includes a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, or a hydrocarbyl-substituted cyclopentadiene as represented by the following respective formulas:





wherein R_1 and R_2 are respectively a hydrocarbyl group, and m and n are respectively zero or a positive integer and the sum of $m + n$ is greater than zero.

15. (Once Amended) The magnetic recording medium of claim 13, wherein the lubricant layer includes a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, or a hydrocarbyl-substituted cyclopentadiene as represented by the following respective formulas:

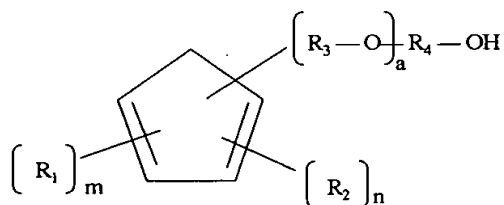
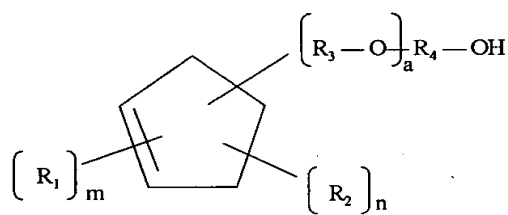
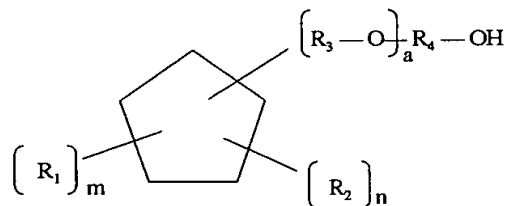


wherein R'_1 and R'_2 are respectively a functionalized hydrocarbyl group which includes a functional group selected from $-OH$, $-NH_2$, carboxylic acid, carboxylic ester, phenolic ester, polyether, amide, amine, sulfonamide, thiophosphate, and phosphate, and m and n are respectively zero or a positive integer and the sum of $m + n$ is greater than zero.

16. (Once Amended) The magnetic recording medium of claim 13, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted

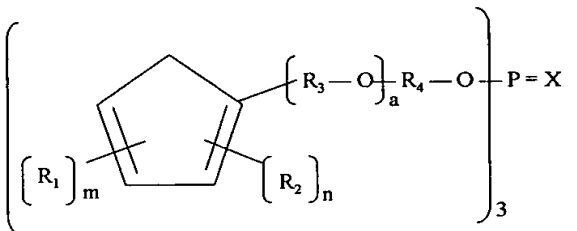
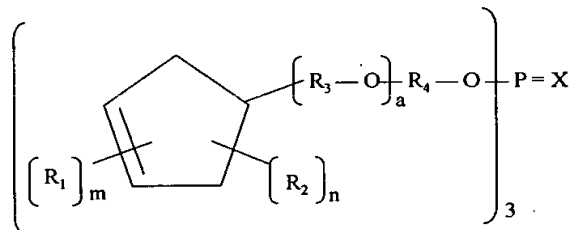
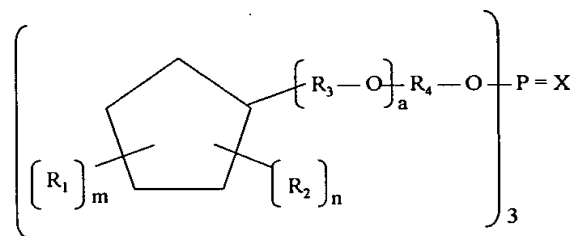
cyclopentadiene include at least one functional group selected from the group consisting of hydroxy, carboxylic acid, amine, carboxylic ester, carboxylic amide, phosphate, and sulfur-containing groups.

17. (Once Amended) The magnetic recording medium of claim 16, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



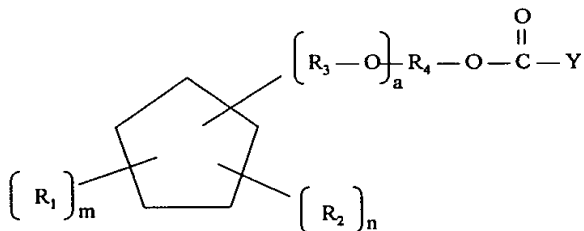
wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1 , R_2 , R_4 are individually a hydrocarbyl group.

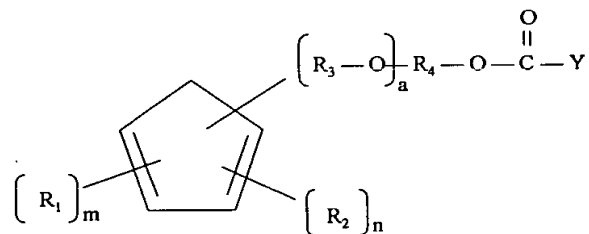
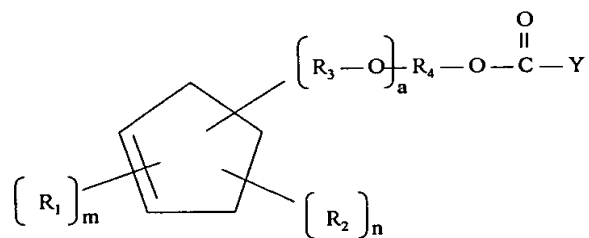
18. (Once Amended) The magnetic recording medium of claim 16, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



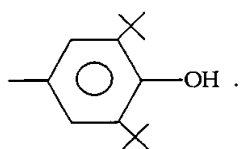
wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1 , R_2 , R_3 , and R_4 are individually a hydrocarbyl group; X is either oxygen or sulfur.

19. (Once Amended) The magnetic recording medium of claim 16, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:

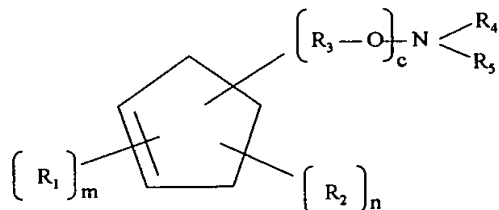
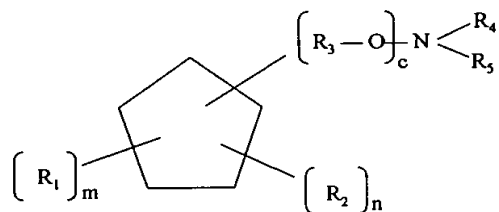


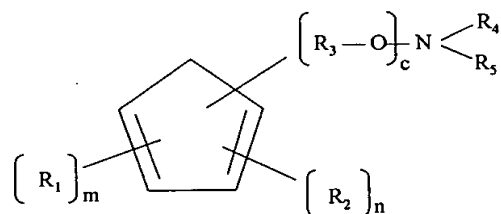


wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1 , R_2 , R_3 , and R_4 are individually a hydrocarbyl group; Y is $-OH$, $-NH_2$, or



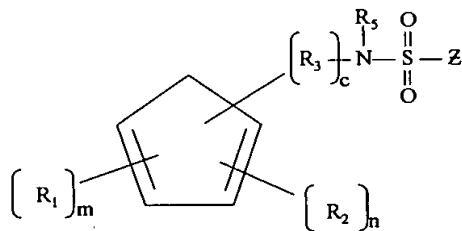
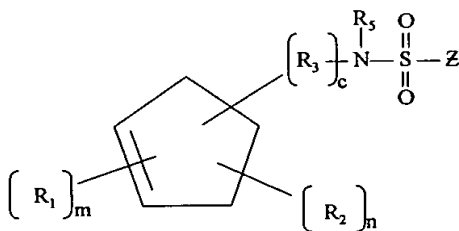
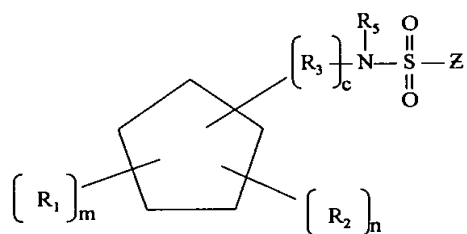
20. (Once Amended) The magnetic recording medium of claim 16, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:





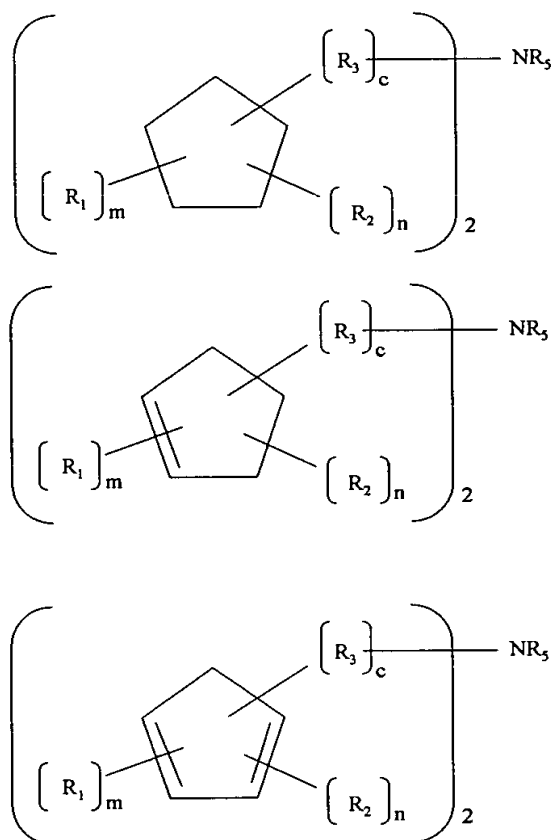
wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1 , R_2 , and R_3 are individually a hydrocarbyl group; R_4 and R_5 individually are hydrogen or hydrocarbyl.

21. (Once Amended) The magnetic recording medium of claim 16, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



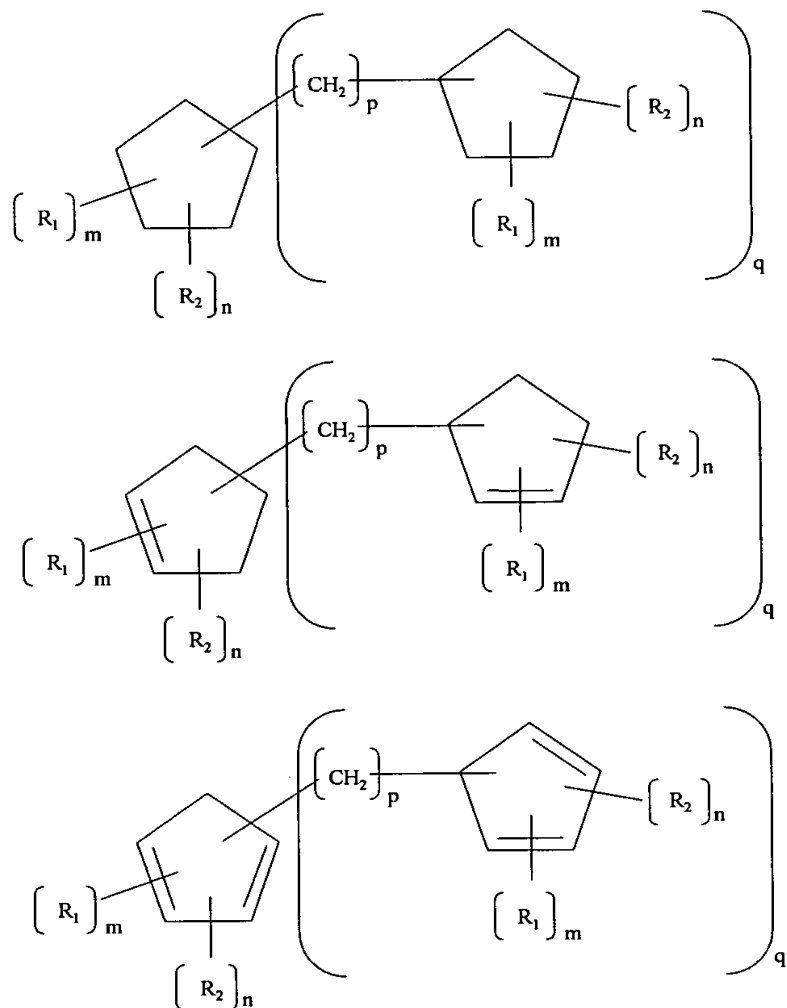
wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1 , R_2 , and R_3 are individually a hydrocarbyl group; R_5 is hydrogen or hydrocarbyl; Z is hydrocarbyl.

22. (Once Amended) The magnetic recording medium of claim 16, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



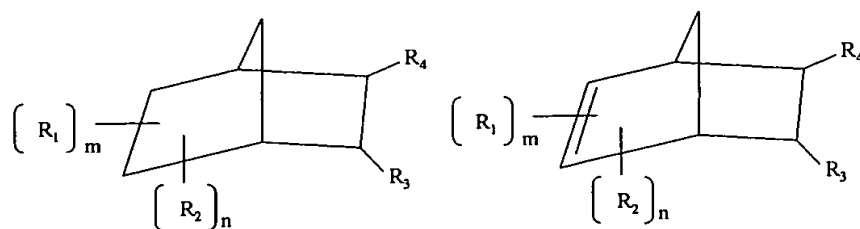
wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R₁, R₂, and R₃ are individually a hydrocarbyl group; R₅ is hydrogen or hydrocarbyl.

23. (Once Amended) The magnetic recording medium of claim 16, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



wherein p is 1, 2, 3, ..., or 10; q is 1, 2, 3, ..., or 10; m and n are zero or a positive integer; R₁ and R₂ are individually a hydrocarbyl group.

24. (Once Amended) The magnetic recording medium of claim 16, wherein the hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



wherein m and n are zero or a positive integers; R₁ and R₂ individually are a hydrocarbyl group; R₃ and R₄ individually are hydrocarbyl, hydroxy, nitrile, carboxylic acid, carboxylic amide, or carboxylic ester.

25. (Once Amended) A magnetic head, comprising:

a head; and

a lubricant layer over at least a portion of the head, the lubricant layer including a compound selected from the group consisting of hydrocarbyl substituted cyclopentane, hydrocarbyl substituted cyclopentene, hydrocarbyl substituted cyclopentadiene, and mixtures thereof.

26. (Once Amended) A data storage/retrieval device, comprising:

a magnetic recording medium including a magnetic layer over a support and a lubricant layer over the magnetic layer, the lubricant layer including a compound selected from the group consisting of hydrocarbyl substituted cyclopentane, hydrocarbyl substituted cyclopentene, hydrocarbyl substituted cyclopentadiene, and mixtures thereof; and

a magnetic head adjacent to the magnetic recording medium, the magnetic head sliding on the magnetic recording medium to read and write information on the magnetic recording medium.

29. (Once Amended) A computer, comprising:

a CPU;

a disk drive connected to the CPU so that the disk drive can communicate with the CPU, the disk drive including:

a magnetic recording medium having a magnetic layer over a support and a lubricant layer over the magnetic layer, the lubricant layer having a compound selected from the group consisting of hydrocarbyl substituted cyclopentane, hydrocarbyl substituted cyclopentene, hydrocarbyl substituted cyclopentadiene, and mixtures thereof; and

a magnetic head adjacent to the magnetic recording medium, the magnetic head sliding on the magnetic recording medium to read and write information on the magnetic recording

medium.

30. (Once Amended) A method of manufacturing a magnetic recording medium, comprising:
providing a non-magnetic support;
forming a magnetic layer on the support; and
forming a lubricant layer over the magnetic layer, the lubricant layer including a compound selected from the group consisting of hydrocarbyl substituted cyclopentane, hydrocarbyl substituted cyclopentene, hydrocarbyl substituted cyclopentadiene, and mixtures thereof.

33. (Once Amended) The magnetic recording medium of claim 32, the additives are cyclic phosphazenes, metallic soaps, fatty acids, amides, fatty acid esters, higher aliphatic alcohols, monoalkyl phosphates, dialkyl phosphates, trialkyl phosphates, paraffins, silicone oils, animal oils, vegetable oils, mineral oils, higher aliphatic amines, inorganic fine powders, resin fine powders, unsaturated aliphatic hydrocarbons, or a mixture thereof.

35. (Once Amended) The magnetic recording medium of claim 34, the additives are cyclic phosphazenes, metallic soaps, fatty acids, amides, fatty acid esters, higher aliphatic alcohols, monoalkyl phosphates, dialkyl phosphates, trialkyl phosphates, paraffins, silicone oils, animal oils, vegetable oils, mineral oils, higher aliphatic amines, inorganic fine powders, resin fine powders, unsaturated aliphatic hydrocarbons, or a mixture thereof.